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[54] **COMPACT FURNIUTURE HINGE**

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[73] Assignee: **Franco Ferrari**, Lecco, Italy

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**^{6} **E05D 15/32**

[52] **U.S. Cl.** **16/370**; 16/335

[58] **Field of Search** 16/370, 368, 369, 16/366, 335, 286, 287, 288

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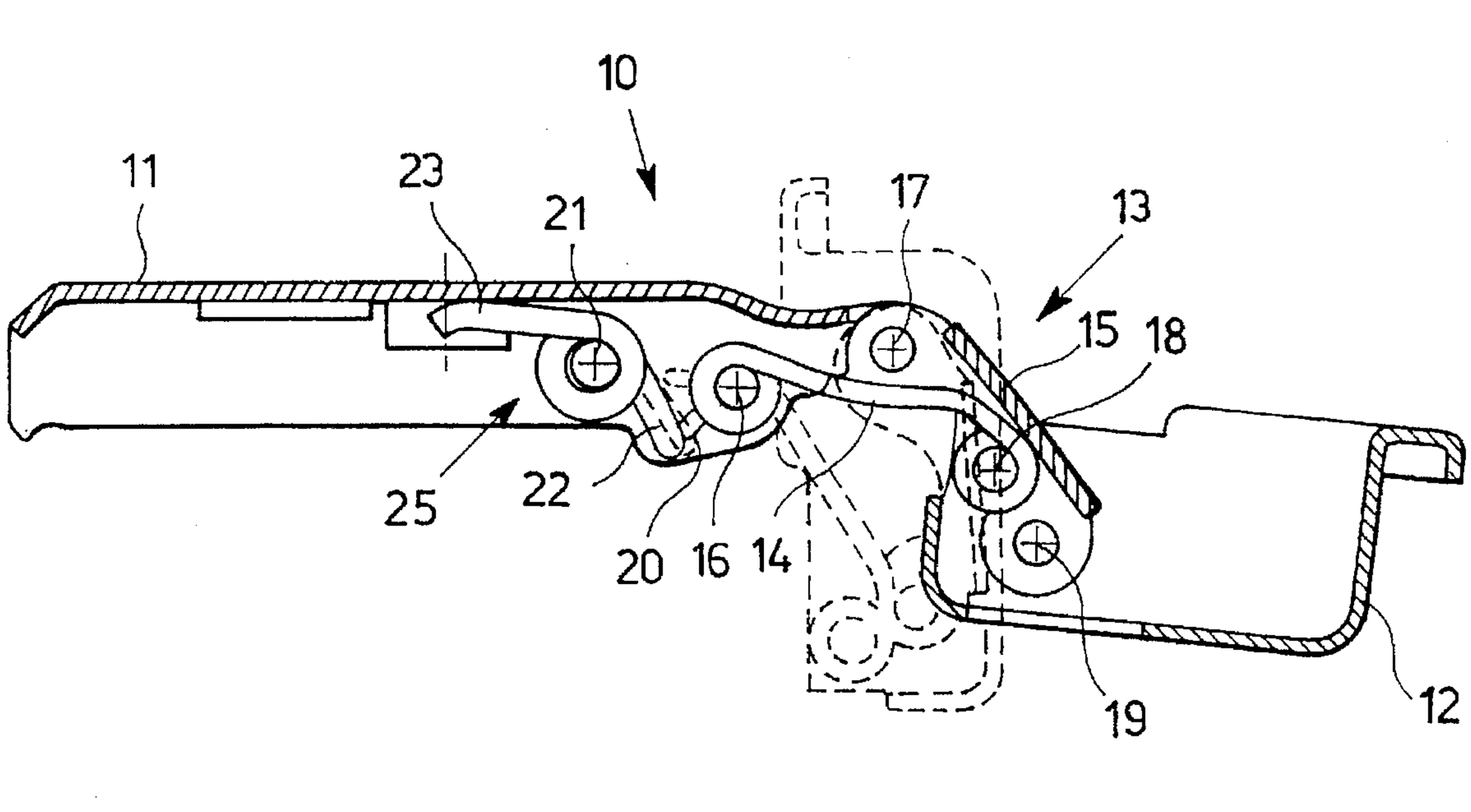
[57] **ABSTRACT**

A furniture hinge (**10**, **110**) has a wing (**11**, **111**) and a cup (**12**, **112**) interconnected with each other by a lower link rod (**14**, **114**) and an upper link rod (**15**, **115**). A torsion spring (**25**, **125**) is wound round a pin (**21**, **121**) inside the wing and parallel to the pivots of the link rods so as to have a thrust arm (**22**, **122**) which acts upon a protrusion (**20**, **120**) of the lower link rod facing towards the pin of the spring to push the hinge towards the closed position during a last section of the movement. The pivoting of the lower link rod (**14**, **114**) to the wing is substantially between the pin (**21**, **121**) of the spring and the pivoting of the upper link rod (**15**, **115**) to the wing. The torsion spring advantageously has a reaction arm (**123**) which rests on the lower link rod (**114**).

8 Claims, 3 Drawing Sheets



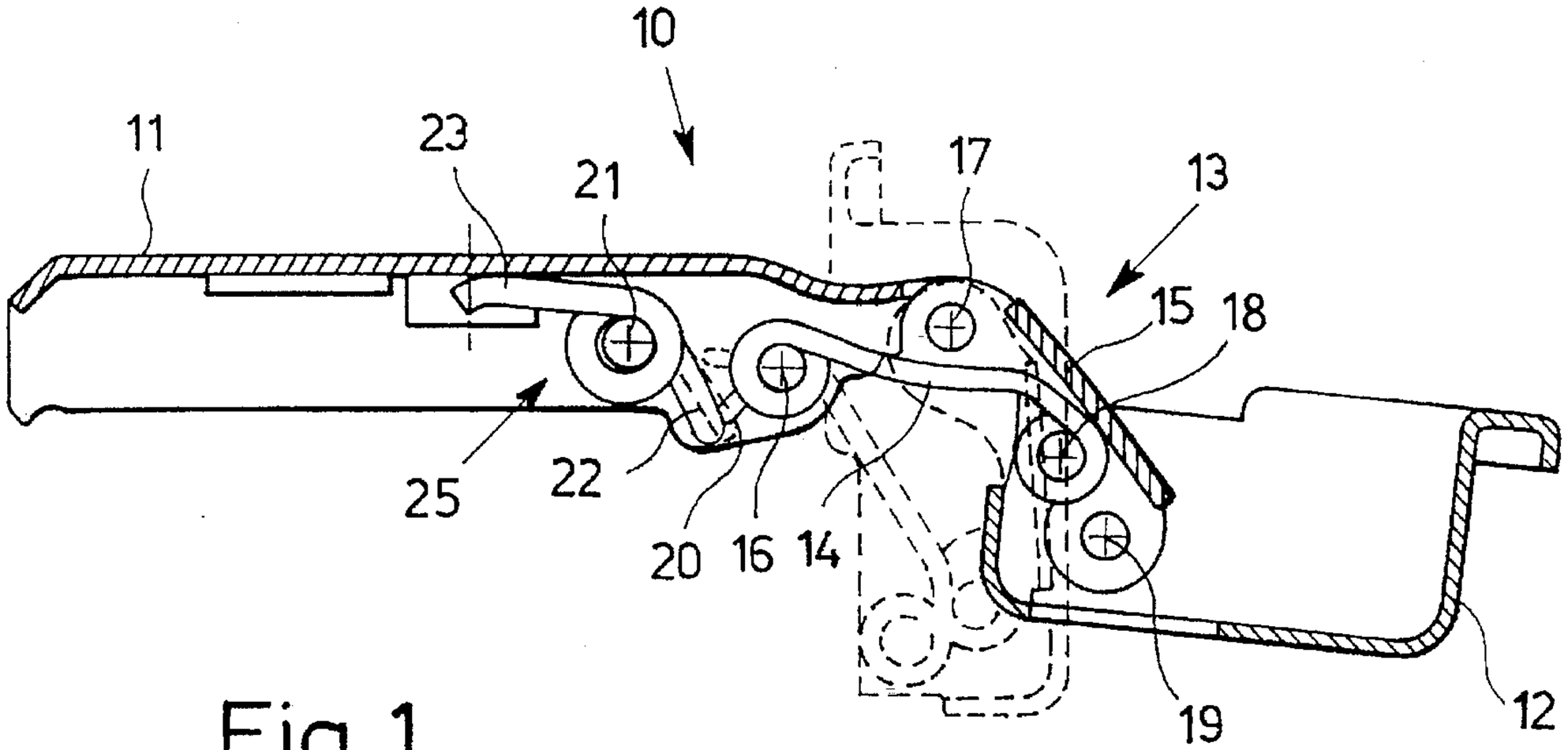

10
11
23
21
17
13
15
18
25
22
20
16
14
19
12

Fig. 1

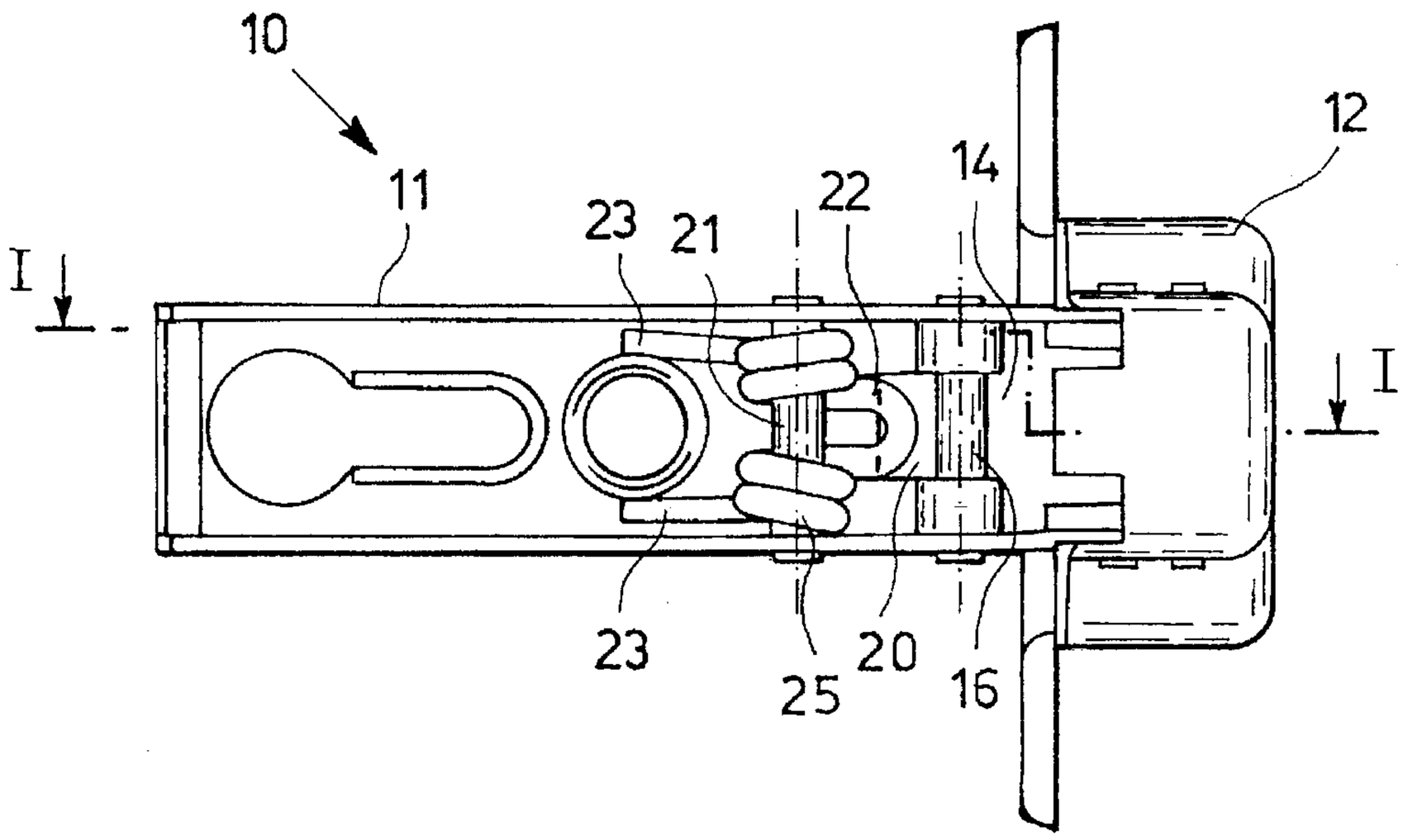

10
11
23
21
22
14
12
I
I
23
25
20
16

Fig. 2

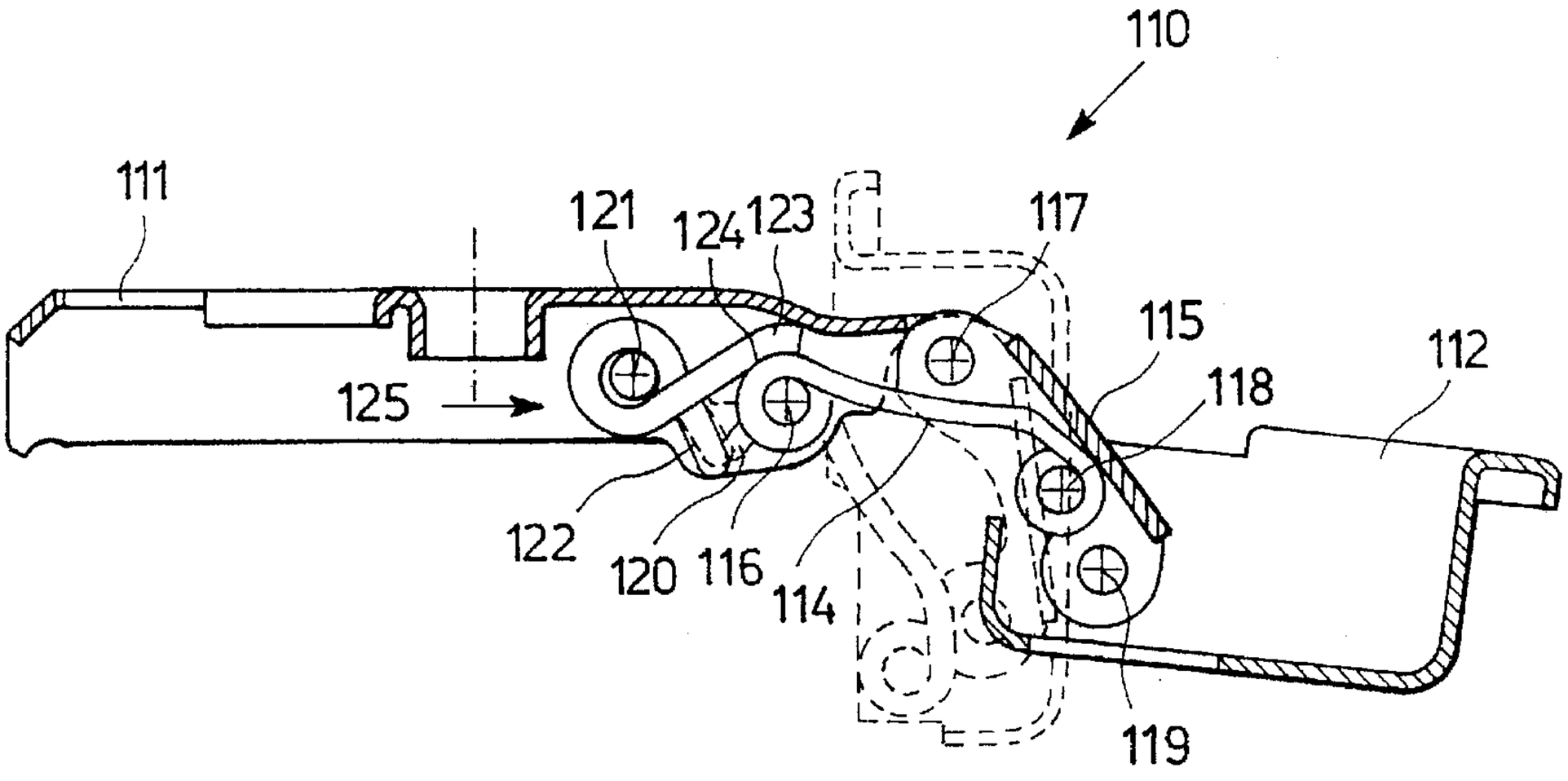

110
111
121
124
123
117
115
112
118
125
122
120
116
114
119

Fig. 3

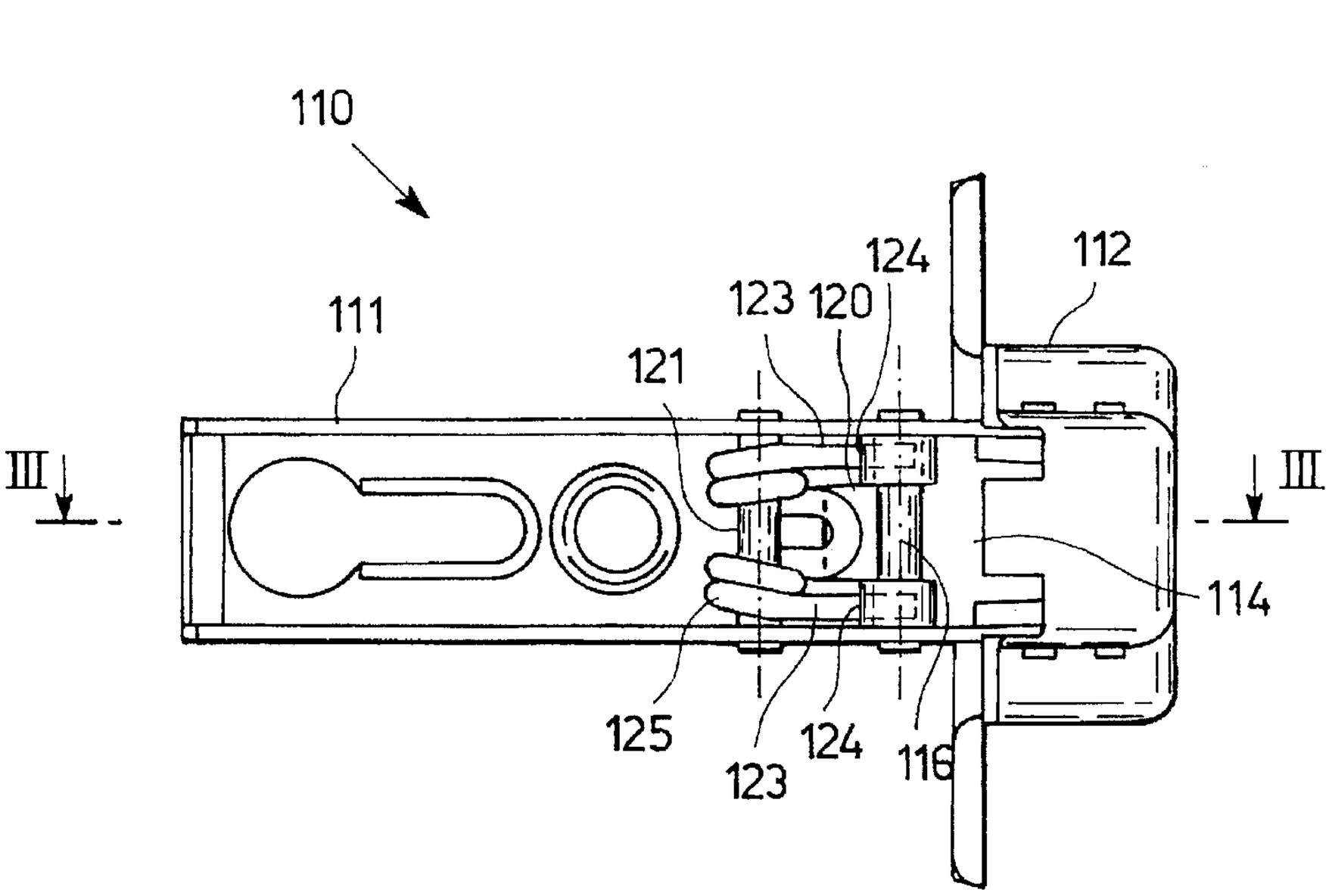

110
111
121
123
120
124
112
III
III
114
125
123
124
116

Fig. 4

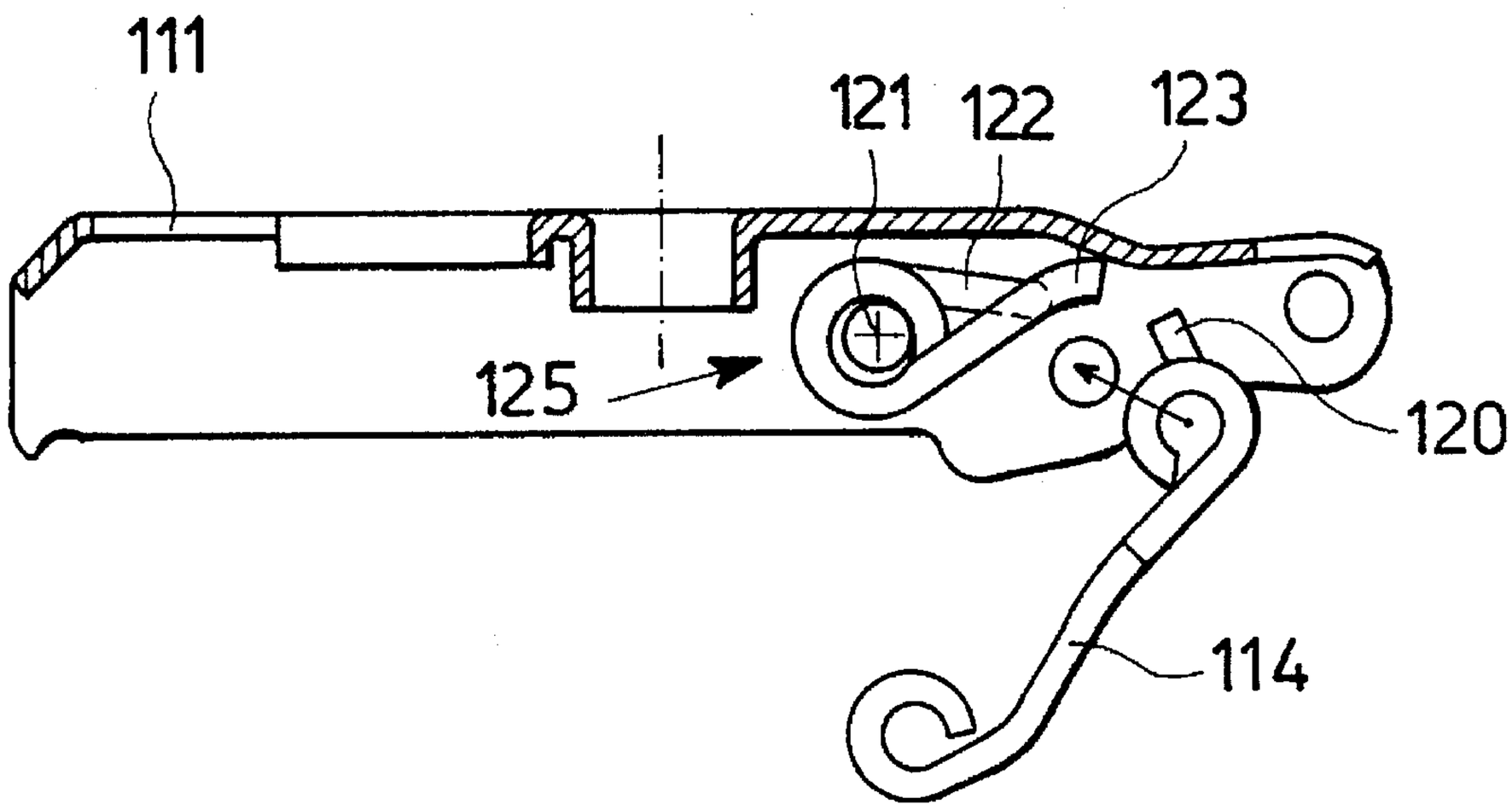


Fig. 5

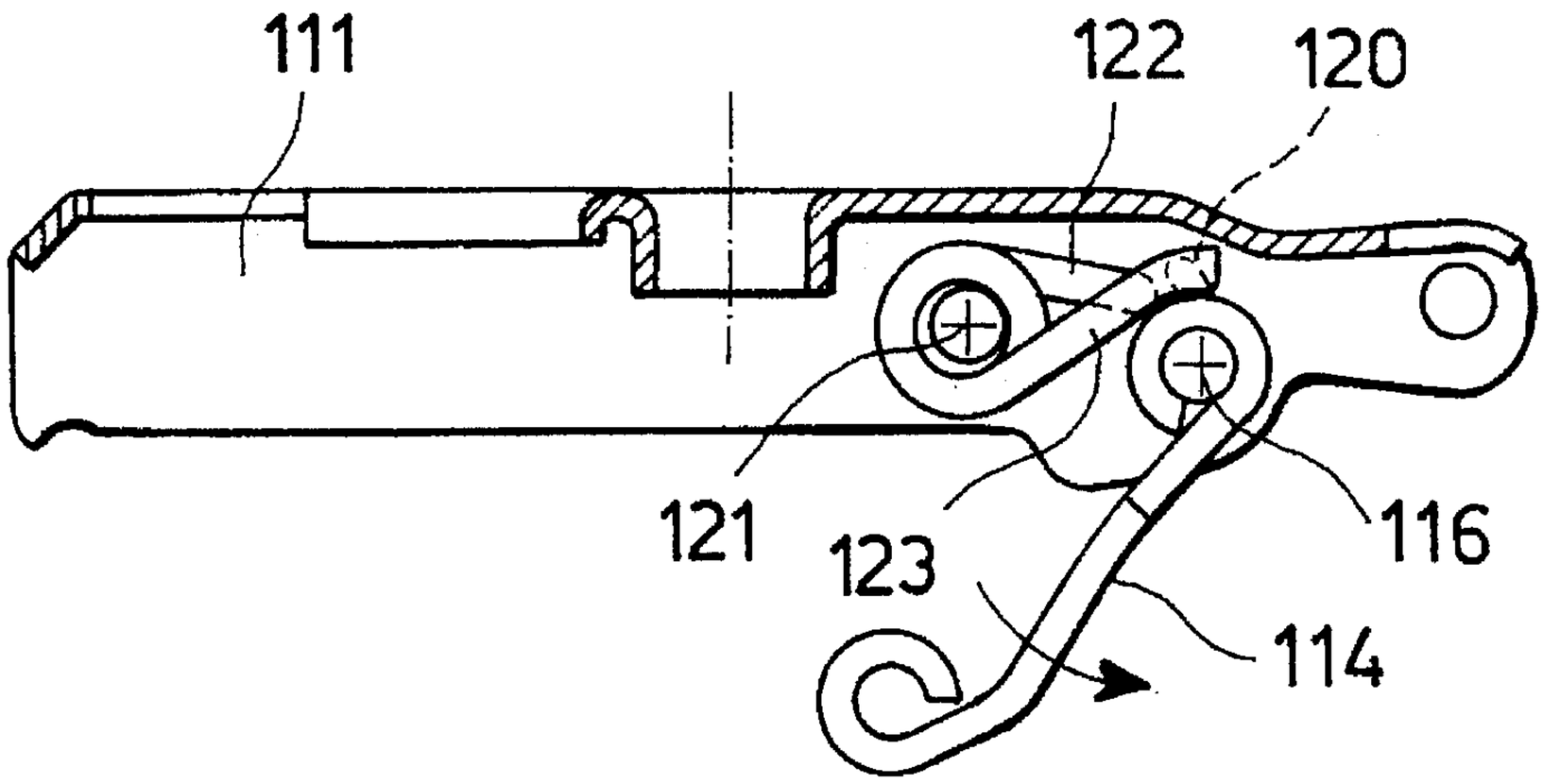


Fig. 6

COMPACT FURNIUTURE HINGE

BACKGROUND OF THE INVENTION

This invention refers to a furniture hinge having an innovative solution in the spring-operated closing mechanism. In particular, the innovative disposition of the mechanism makes it possible to obtain "gently" closing compact hinges.

For many years widespread use has been made of articulated furniture hinges provided with a spring-operated mechanism which enables the door to close automatically. Among these are some particularly interesting hinges from the commercial point of view which close "gently", that is to say which snap shut only at the last few degrees of closure, while remaining free for the remaining span of the movement. Various configurations of positioning and action of the spring-operated mechanism are known in the known technique. For example, use is very often made of a torsion spring wound round the pivot pin of the upper link rod of the hinge to act upon a cam protrusion on the lower link rod.

These configurations, however, call for relatively large space inside the wing. In particular, they call for a relatively large space between the pivot of the lower cam and the ceiling of the wing, such space having to accommodate the spring and the cam protrusion and permit their movement. This restricts the design of the hinge enormously, since the pivoting of the link rod has to be positioned well below the pivoting of the other arm, around which the spring is wound. This results in considerable limitation to the kinematic performance of the hinge. This inconvenience is all the more critical the smaller the hinge is. With the known solutions it is therefore virtually impossible to obtain "gently-closing" hinges of limited dimensions. For hinges of very limited dimensions it is consequently necessary to do without the "gentle" closure. The only expedient has been to place a leaf spring outside the wing, resulting in considerable problems in assembling the hinge as well as aesthetical problems.

The general scope of this invention is to obviate the aforementioned problems, by providing a hinge with a spring-operated closing mechanism which, while retaining its features of "gentle" closure, makes it possible to produce a hinge of very limited dimensions, advantageously also providing extensive freedom in the positioning of the spring-operated mechanism and outstanding kinematic efficiency.

SUMMARY OF THE INVENTION

This scope is achieved according to the invention by providing a furniture hinge having a wing and a cup interconnected with each other by a lower ink rod and an upper link rod pivoted at one end to the cup and at the other end to the wing, so that the wing and cup are reciprocally articulated so as to be movable between a closed hinge position and an open hinge position, a torsion spring having a thrust arm which acts on one of the link rods to push the hinge towards the closed position during the last section of its movement from the open to the closed position characterized by the fact that the spring is wound round a pin inside the wing and parallel to the pivoting of the link rod, the pivoting of the lower link rod to the wing being substantially between the pin of the spring and the pivoting of the upper link rod to the wing the end of the lower link rod which is pivoted to the wing having a portion facing towards the pin of the spring which has a cam protrusion on which the thrust arm of the spring rests in order to push it towards the closed position.

BRIEF DESCRIPTION OF THE DRAWINGS

The innovative principles of this invention and its advantages with respect to the known technique will be more

clearly evident from the following description of a possible exemplificative and non restrictive embodiment applying such principles, with reference to the accompanying drawings, in which:

FIG. **1** shows a partially cutaway schematic side view alone the line I—I of FIG. **2** of a hinge in the open position;

FIG. **2** shows a schematic bottom view of the hinge of FIG. **1** in the closed position;

FIG. **3** shows a partially cutaway schematic side view along the line III—III of FIG. **4**, of a second hinge in the open position;

FIG. **4** shows a schematic bottom view of the hinge of FIG. **3** in the closed position;

FIGS. **5** and **6** show partially cutaway schematic side views of a first and a second step of the assembly of the hinge of FIG. **3**.

DETAILED DESCRIPTION OF THE INVENTION

With reference to the figures, FIG. **1** shows a hinge according to the invention; generically indicated by reference **10**. The binge **10** comprises a wing **11** and a cup **12** connected to each other by means of an articulation **13** composed of an arm or lower liner rod **14** and an arm or upper link rod **15**; pivoted. respectively to the wing at **16** add **17** and respectively to the cup at **18** and **19**.

According to the known technique, the wing is designed to be secured to a furniture unit by means of known fastening means, for example adjustable, not shown, while the cup is designed to be secured in a complementary recess provided in a door.

According to the innovative principles of this invention, wound around a further pin **21** transversal to the wing is a double torsion spring **25**, for example, made of wire. The pin of the spring **25** is disposed in the wing so that the pin **16** of the lower link rod is positioned between the pin of the spring and the pin **17** of the upper link rod, and almost on a line joining the centers of the pins **17** and **21**. The lower link rod **14** has portions of one end thereof wound round the pivot **16** adjacent opposite ends thereof, and has an integral lateral cam protrusion **20** on its same end directed into the space between the pin **16** of the lower link rod and the pin **21** of the spring and therefore is directed substantially away from and in the opposite direction to the pin **17** of the upper link rod.

As can be clearly seen in FIG. **2** the protrusion **20** can be obtained by cutting and unfolding a central area of the same end of the link rod **14** made of folded sheet metal. The spring **25** has one thrust end **22** which rests on the cam protrusion **20** and a second end engaging and reacting on the wing. In particular, the second end of the spring is made in the form of parallel arms **23**, each resting inside the ceiling of the wing.

As can be seen in FIG. **1** from the comparison between the continuous line drawing (shown the open hinge) and the broken line drawing (showing the closed hinge) the closing movement of the hinge causes the spring to stretch. During the movement the cam protrusion remains beneath a line ideally traced between the centres of the pins **16** and **21**. As will be obvious to the expert in the field, by suitably dimensioning and positioning the spring and cam protrusion to adjust the thrust arm on the protrusion according the angle of rotation of the link rod, the closing action can be made to take place mainly at a desired angle near to the complete closing, so as to provide a "gentle " closing action. The

action of the spring, directed upwards, is highly effective also due to the fact that proceeding towards the closure increases the arm applying pressure on the lower link rod, while it decreases the free arm of the spring, that is to say, the cam rests on the spring in a position increasingly nearer to the axis (pin **21**) of its turns. From FIG. **1** it is obvious how a hinge according to the invention can be kept of limited dimensions, the reduction in height of the wing being in substance practically limited only by the external diameter of the coils of the spring.

Due to the advantageous efficiency offered by the closing mechanism made according to the invention it is possible to use springs with a relatively limited thrust and, therefore, with a smaller wire thickness. Moreover, the pivoting point of the spring is outside the kinematic mechanism of the hinge and consequently the design of the hinge does not have to take the dimensions of the spring into account.

FIGS. **3** and **4** show (indicating the elements similar to those of FIG. **1** by the same numbers preceded by one hundred) an advantageous variation to the hinge described up to this point. In this variation, the spring **125** is bent into an "alpha" shape so that the reaction end also rest on the end of the lower link rod **114**. The reaction end rests in an area of the end of the link rod above the line of conjunction between the pin of the spring and the pivot of the link rod **114**. In particular, as can be clearly seen in FIG. **4** the spring has reaction arms **123** which rest, in the vicinity of the lateral ends of the pivot **116**, on a substantially cylindrical wound portion **124** of the end of the lower link rod **114**.

In FIG. **3** it can be seen that when the hinge **110** moves open, the lower link rod compresses the spring by means of the protrusion or tab **120**, pulling the opposing ends **122**, **123** of the spring apart from each other. Upon reclosure of the hinge, an efficient thrust action is obtained, as previously described for the embodiment of FIG. **1**.

In addition to the advantages described for the embodiment of FIG. **1** the fact that the spring **125** has resting points on the link rod and not on the wing permits considerable freedom in the positioning of the unit composed of spring **125** and link rod **114** inside the wing.

In particular, the assembly composed of the pin **121** of the spring and the protrusion **120** can be ideally rotated around the pivoting axis **116** of the link rod, maintaining the functioning of the closing mechanism unchanged. This enables the designer of the hinge to more effectively exploit the space inside the wing and avoid restrictions. In this way, it is extremely simple to design particular hinges; such as for example those of the type with curved or swan-necked wings, even of limited dimensions.

At this point it will be clear that the intended scopes have been achieved by providing a hinge with an efficient spring-operated closing mechanism which does not suffer from excessive dimensional restrictions.

Hinges according to the innovative principles of this invention have further advantages compared to the known technique also as regards their manufacture.

In fact, it is not necessary for example to preload the spring in order to be able to position it in the wing, as was necessary on the contrary in the known hinges.

FIGS. **5** and **6** show an assembling sequence for assembling the spring and the lower link rod in the wing for the hinge of FIG. **3**. As can be seen in FIG. **5**, the spring is fitted and pivoted in the wing without any preloading whatsoever. After this the lower link rod is fitted in the wing with a simple rectilinear movement (in the direction indicated in FIG. **5**), so as to be able to pivot it to the wing in a position with the protrusion **120** close to the end of the arm **122** of the spring, as shown in FIG. **6**. Once the link rod and spring are pivoted, it is sufficient to rotate the link rod in the direction shown by the arrow in FIG. **6** to load the spring and shift the link rod into position to pivot it to the cup together with the upper link rod.

The various assembling phases are consequently extremely simple and do not call for special complicated tools, as are required for the known hinges.

If, when the spring is unload the arm **122** of the spring comes to rest with its free end over the line of conjunction between pins **16** and **21**, it is sufficient for the arm to be of such length that the curve of the movement of the free end during the loading does not intersect the pin **116**. In other words, the arm must be shorter in length than the free space between the pin of the spring and the pivot of the link rod.

The assembling procedure for the hinge of FIG. **1** is obviously similar.

At this point it will be clear that the intended scopes have been achieved by providing hinges with limited dimensions and a highly efficient closing mechanism. The foregoing description of embodiments applying the innovative principles of this invention is obviously given by way of example in order to illustrate such innovative principles and should not therefore be understood as a limitation to the sphere of the invention claimed herein. For example, thanks also to the innovative solution claimed herein, the exact shape of the hinge, the positioning of the parts and their relative size may differ from what has been shown in the figures. The spring and the link rod can also be made so that the cam protrusions are two in number, close to the two ends of the pin **16** and the spring rests on them by means of the two parallel arms **23** or **123**, while the loop-shaped end **22**, **122** constitutes the reaction end and rests either against the wing or on a cylindrical surface achieved rolling the link rod around the pin **16** in a central position to the two protrusions.

What is claimed is:

1. A compact furniture hinge having a wing and a cup interconnected with each other by a lower link rod and an upper link rod, each of said rods being pivoted at one end thereof to one of two parallel pivot pins secured to the cup and at the other end thereof to one of two further, parallel pivot pins secured to the wing, so that the wing and cup are reciprocally articulated so as to be movable between a closed hinge position and an open hinge position and a torsion spring having a thrust arm which acts on one of said link rods to push the hinge towards the closed position during the last section of its movement from the open to the closed position, and characterized by the fact that the spring is a double torsion spring wound intermediate its ends round a fifth pin mounted inside the wing and extending parallel to the pivotal axes of the upper and lower link rods, the pivot pin connecting the lower link rod to the wing being positioned substantially between the fifth pin supporting the spring and the pivot pin connecting the upper line rod to the wing, the end of the lower link rod which is pivoted to the wing having a portion thereof defining a cam protrusion facing towards said fifth pin, and the spring having formed intermediate its ends a central loop defining said thrust arm and being engaged with said cam protrusion to push said hinge towards the closed position.

2. Hinge as claimed in claim **1** characterized by the fact that the torsion spring has formed on one end thereof a pair of parallel reaction arms which rest on an internal portion of the wing.

3. Hinge as claimed in claim **1**, characterized by the fact that the torsion spring has on one end thereof a pair of parallel reaction arms which rest on the lower link rod.

4. Hinge as claimed in claim 3, characterized by the fact that the reaction arms engage the end of the lower link rod which is pivoted to the wing.

5. Hinge as claimed in claim 3, characterized by the fact that the reaction arms of the spring rest on the end of the lower link rod pivoted to the wing, in a position above an imaginary line of conjunction between the fifth pin supporting the spring and the pivot of the lower link rod.

6. Hinge as claimed in claim 1, characterized by the fact that during movement of the hinge the cam protrusion moves along the thrust arm of the spring while remaining

below an imaginary line of conjunction between said fifth pin and the pivot pin of the lower link rod to the wing.

7. Hinge as claimed in claim 1, characterized by the fact that the cam protrusion is made in the form of an extended central portion of the pivoted end of the lower link rod which is made from bent sheet metal.

8. Hinge as claimed in claim 1, characterized by the fact that the length of the thrust arm of the spring is shorter than the space between the fifth pin supporting the spring and the pivot pin connecting the lower link rod to the wing.

* * * * *